Appln. No. 10/790,971
Amendment Dated Sept. 14, 2004
Reply to Office Action of June 15, 2004

BRM-100US1

Amendments to the Claims: This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1.   (Currently Amended) A bias fiber holder for holding a bias fiber under tension, as part of a loom, comprising~;~:

a ceramic vacuum cylinder to hold a bias fiber under <u>constant vacuum</u> tension; and

gripping means adapted to be releasably gripped by at least one of a bias shuttle and an independently controllable bias ~arms~<u>arm</u>.

2.   (Original) The bias fiber holder according to claim 1, wherein a vacuum is applied to the ceramic vacuum cylinder by the bias shuttle, when the bias fiber holder is being gripped by the bias shuttle.

3.   (Original) The bias fiber holder according to claim 1, wherein the gripping means is a plurality of tubes.

4.   (Original) The bias fiber holder according to claim 3, wherein the plurality of tubes include:

a pair of shuttle gripping tubes configured to be releasably gripped by the bias shuttle; and

a pair of arm gripping tubes configured to be releasably gripped by the independently controllable bias arm.

5.   (Original) A loom for weaving three dimensional structures which include a plurality of warp fibers, a fill fiber, and a plurality of bias fibers, the loom comprising:

a plurality of bias fiber holders, each bias fiber holder holding a bias fiber under tension;

a plurality of bias shuttles, each bias shuttle releasably gripping at least one of the plurality of bias fiber holders and translating horizontally, at a separate vertical position, the gripped bias fiber holders between a plurality of predetermined horizontal positions, at least one bias shuttle configured to translate above a shed formed by the warp fibers and at least one bias shuttle configured to translate below the shed; and

a plurality of independently controllable bias arms, each independently controllable bias arm releasably gripping one of the plurality of bias fiber holders and translating the gripped bias fiber holder, at one of the predetermined horizontal positions, with a range of motion extending at least between two of the bias shuttles.

6.   (Original) A loom for weaving three dimensional structures which include a plurality of warp fibers, a fill fiber, and a plurality of bias fibers, the loom comprising:

a plurality of heddles, each heddle engaging one of the plurality of warp fibers and independently translating the engaged warp fiber vertically between at least one upper warp position and at least one lower warp position, forming a shed;

a plurality of bias fiber holders, each bias fiber holder holding a bias fiber under tension;

a plurality of bias shuttles, each bias shuttle releasably gripping at least one of the plurality of bias fiber holders and translating horizontally, at a separate vertical position, the gripped bias fiber holders between a plurality of predetermined horizontal positions, at least one bias shuttle configured to translate above the shed and at least one bias shuttle configured to translate below the shed;

a plurality of independently controllable bias arms, each independently controllable bias arm releasably gripping one of the plurality of bias fiber holders and translating the gripped bias fiber holder, at one of the predetermined horizontal positions, with a range of motion extending at least between two of the bias shuttles;

Appln. No. 10/790,971
Amendment Dated Sept. 14, 2004
Reply to Office Action of June 15, 2004

BRM-100US1

a weave shuttle passing the fill fiber through the shed formed by the warp fibers and the bias fibers substantially along a centerline of the shed; and

a reed for beat up.

7.   (Original) The loom according to claim 6, wherein the plurality of heddles are Jacquard-controlled.

8.   (Original) The loom according to claim 6, wherein the plurality of bias shuttles further includes at least one bias shuttle configured to translate within the shed.

9.   (Original) The loom according to claim 6, wherein each bias fiber holder includes a ceramic vacuum cylinder to hold a bias fiber under tension.

10.   (Original) The loom according to claim 9, wherein each bias shuttle applies a vacuum to the ceramic vacuum cylinder of each bias fiber holder being translated by the bias shuttle.

11.   (Original) The loom according to claim 6, wherein each bias fiber holder includes a plurality of tubes configured to be releasably gripped by at least one of the plurality of bias shuttles and the plurality of independently controllable bias arms.

12.   (Original) The loom according to claim 11, wherein the plurality of tubes of each bias fiber holder include:

a pair of shuttle gripping tubes configured to be releasably gripped by the plurality of bias shuttles; and

a pair of arm gripping tubes configured to be releasably gripped by the plurality of independently controllable bias arms.

13.   (Original) The loom according to claim 6, wherein the plurality of predetermined horizontal positions are selected.such that each of the plurality of warp fibers is between two of the predetermined horizontal positions.

14.   (Original) The loom according to claim 6, wherein the plurality of independently controllable bias arms includes:

an upper subset of independently controllable bias arms, the range of motion of each independently controllable bias arm of the upper subset extending from above the shed to the centerline of the shed; and

a lower subset of independently controllable bias arms, the range of motion of each independently controllable bias arm of the lower subset extending from below the shed to the centerline of the shed.

15.   (Original) The loom according to claim 14, wherein:

a subset of the predetermined horizontal positions is selected to be located between pairs of warp fibers; and

the independently controllable bias arms are configured such that one of the upper subset and one of the lower subset of the independently controllable bias arms in each of the subsets of the predetermined horizontal positions align to transfer a gripped bias fiber holder between the two aligned independently controllable bias arms at the centerline of the shed in one of the subsets of the predetermined horizontal positions.

16.   (Original) A loom for weaving three dimensional structures which include a plurality of warp fibers, a fill fiber, and a plurality of bias fibers, the loom comprising:

a plurality of heddles, each heddle engaging one of the plurality of warp fibers and independently translating the engaged warp fiber vertically between at least one upper warp position and at least one lower warp position, forming a shed;

a plurality of bias fiber holders, each bias fiber holder including a ceramic vacuum
cylinder configured to hold a bias fiber under tension;.

a plurality of bias shuttles, each bias shuttle releasably gripping at least one of the
plurality of bias fiber holders and translating horizontally, at a separate vertical
position, the gripped bias fiber holders between a plurality of predetermined
horizontal positions, at least one bias shuttle configured to translate above the shed,
at least one bias shuttle configured to translate below the shed, and at least one bias
shuttle configured to translate within the shed;

wherein the plurality of predetermined horizontal positions are selected such that
each of the plurality of warp fibers is between two of the predetermined horizontal
positions;

a plurality of independently controllable bias arms, each independently controllable
bias arm releasably gripping one of the plurality of bias fiber holders and translating
the gripped bias fiber holder, at one of the predetermined horizontal positions, the
plurality of independently controllable bias arms including;

an upper subset of independently controllable bias arms, the range of motion of each
independently controllable bias arm of the upper subset extending from above the
shed to the centerline of the shed; and

a lower subset of independently controllable bias arms, the range of motion of each
independently controllable bias arm of the lower subset extending from below the
shed to the centerline of the shed with a range of motion extending at least between
two of the bias shuttles;

wherein each bias fiber holder includes a plurality of tubes configured to be
releasably gripped by at least one of the plurality of bias shuttles and the plurality of
independently controllable bias arms;

Appln. No. 10/790,971
Amendment Dated Sept. 14, 2004
Reply to Office Action of June 15, 2004

BRM-100US1

a weave shuttle passing the fill fiber through the shed formed by the warp fibers and the bias fibers substantially along a centerline of the shed; and

a reed for beat up.

17. (Original) The loom according to claim 16, wherein the plurality of heddles are Jacquard-controlled.

18. (Original) The loom according to claim 17, wherein each bias shuttle applies a vacuum to the ceramic vacuum cylinder of each bias fiber holder being translated by the bias shuttle.

19. (Original) The loom according to claim 17, wherein the plurality of tubes of each bias fiber holder include:

a pair of shuttle gripping tubes configured to be releasably gripped by the plurality of bias shuttles; and

a pair of arm gripping tubes configured to be releasably gripped by the plurality of independently controllable bias arms.

20. (Original) The loom according to claim 17, wherein:

a subset of the predetermined horizontal positions is selected to be located between pairs of warp fibers; and

the independently controllable bias arms are configured such that one of the upper subset and one of the lower subset of the independently controllable bias arms in each of the subsets of the predetermined horizontal positions align to transfer a gripped bias fiber holder between the two aligned independently controllable bias arms at the centerline of the shed in one of the subsets of the predetermined horizontal positions.